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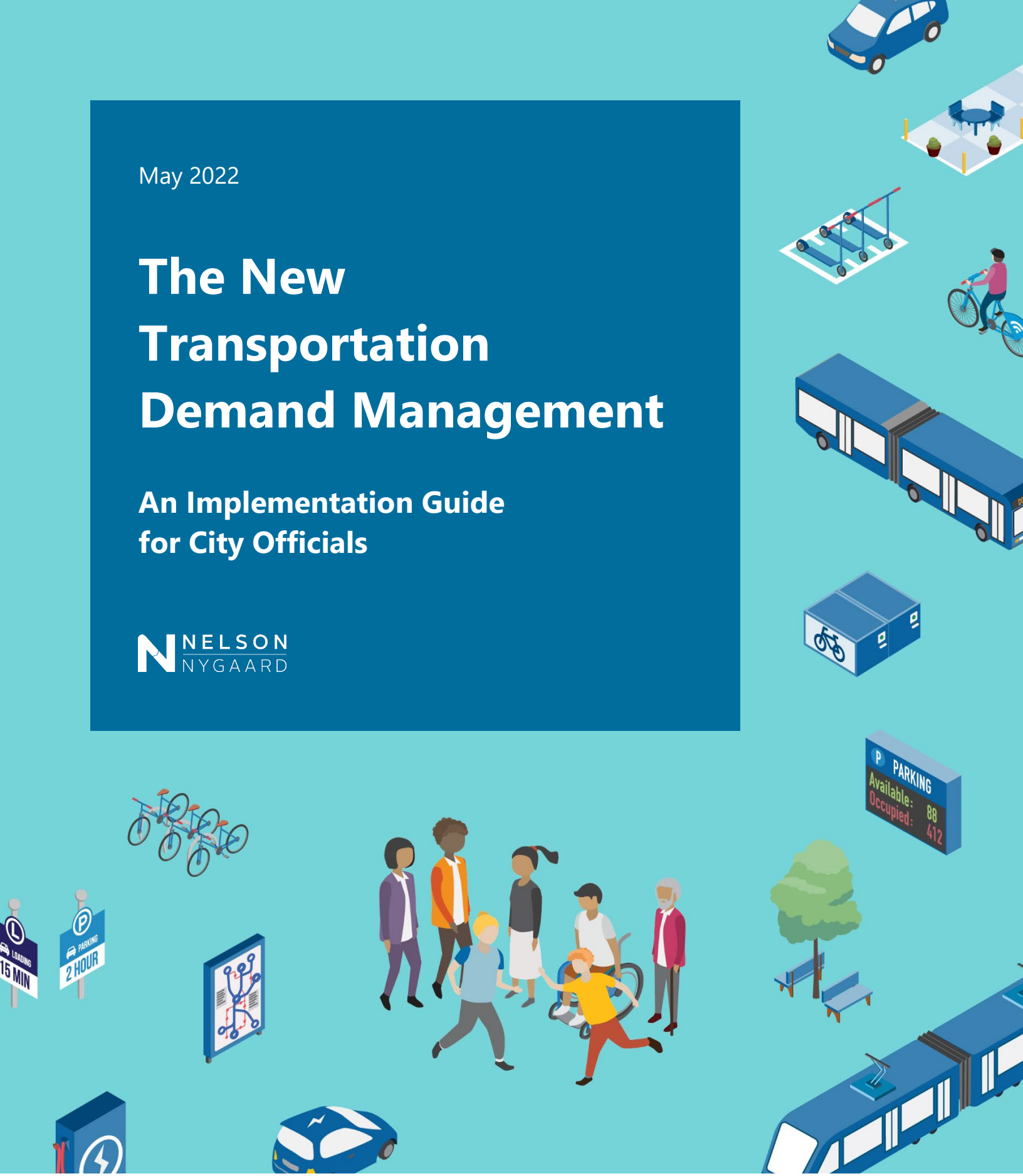
The New Transportation Demand Management

An Implementation Guide for City Officials

NELSON NYGAARD



PREPARED FOR THE

American Cities Climate Challenge

Table of Contents

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1 Introduction

BACKGROUND

Americans' dependence on cars and trucks as the dominant means of personal transportation is built on a foundation of dispersed and isolated land use patterns and automobile-centric urban street design, both of which have in turn been created by a complex array of policy and investment decisions. These decisions are propped up by thousands of subtle and pervasive rules, regulations, processes, and incentives that have accumulated over time in city, state, and federal law; in local development processes; in transportation, planning, and public works department processes and regulations; and beyond. Untangling this complex web of rules and regulations requires a systematic approach to updating policy incentives to align with broadly held public goals—for example, the goal of creating transportation systems that provide equitable; affordable; and sustainable access to jobs, education, healthy food, recreation, and community for all.

"Transportation demand management," or TDM, is a wonky yet useful phrase that encompasses a suite of transportation policies and programs that are a critical component of a systematic and equitable transportation strategy. As originally conceived, TDM was defined as the people-focused companion to the infrastructure-focused "supply management," i.e., tweaking the operations of streets and highways to accommodate ever more cars. More specifically, early TDM programs were designed to influence peak-direction travel away from the peak-congestion times or toward non-driving modes that could ease roadway congestion. Especially when focused on providing "commute options," such TDM programs primarily benefit those with steady, conventional forms of employment and traditional, workweek schedules. While such programs can provide significant benefits that advance equity among participants—especially when they reduce or remove the cost of transit commuting or provide benefit for those who do not drive alone to work—their focus on people with the option of a drive-alone, rush-hour commute invariably excludes from its benefits the most consistently disenfranchised, under-served populations within our communities.

Over time, TDM has expanded to apply more broadly to policies and programs designed to support and incentivize healthier, more environmentally sustainable transportation behaviors. This shift toward a more expansive definition of TDM has paralleled an expansion in the transportation industry from a narrower focus on minimizing congestion for personal autos, to a broader focus on improving transportation access for people, irrespective of transportation mode. This broader focus now includes improving access for more than just typically white, suburban, white-collar commuters. By expanding its goals, TDM can and must expand who benefits by engaging often-marginalized communities, tailoring programs to serve them, and reinforcing that improving access for all benefits all.[1]

TDM policies and programs under this newer paradigm could be as diverse as reforms to the land use development process, employer-administered educational and alternative-commute subsidy programs, or even changes to parking rules and requirements. This diversity of policy and

[1] https://nelsonnygaard.com/five-steps-toward-equitable-inclusive-tdm/ and https://nelsonnygaard.com/transit-equity-is-not-only-about-which-communities-transit-serves-its-also-about-when/, accessed 9/23/2021.

program elements reflects the complex and deeply entrenched system of automobile dependence. Reorienting this system to support healthier, safer, more equitable, and more environmentally sustainable transportation choices will require strong TDM policy, as a complement to various other transportation and land use reforms. Recovery from the COVID-19 pandemic offers further opportunity to shift focus away from "flattening the peak" to these broader goals more aligned with core values around equity, sustainability, and access.[2]

THE BASIC TDM BUILDING BLOCKS

The key to effective TDM programs is the implementation of specific measures—in the form of policies or actions—that seek to effect specific behavior changes, whether collectively or at the individual level. These can be viewed as the basic building blocks of any TDM initiative. While many can function as significant, direct TDM initiatives individually, most will be much more effective when implemented together. To reflect shared and distinctive characteristics of these measures, they can be organized into the following functional categories.

Pricing Measures

These measures focus on attaching a cost to less-efficient and/or higher-emitting forms of mobility, typically resulting in revenues that can be used to fund complementary TDM measures.

- Charging for parking as an optional amenity
- Cash benefit as alternative to parking benefits ("parking cash-out")
- Roadway fees and congestion pricing
- Fees for curbside loading/unloading (commercial or passenger)
- Discounted fees for high-occupancy, and or low-emission vehicles

Physical Measures

Physical TDM measures seek to improve the functionality, safety, and appeal of non-driving mobility infrastructure and amenities through direct, capital investments.

- Constrained parking supply
- Bike parking and amenities
- Showers and changing facilities to promote active-mode use
- Real-time, multimodal information displays
- Shared-vehicle stations or parking
- Transit stops and stop improvements
- Active-mode network improvements
- Remote-work spaces and amenities

[2] https://nelsonnygaard.com/the-new-tdm-challenge-flattening-the-return-to-work-sov-curve/ and https://www.nytimes.com/2021/06/11/upshot/rush-hour-remote-work.html, accessed 9/23/2021.

Programs and Policies

These measures focus on expanding mobility options, reducing the cost of non-driving modes, or creating trip-deferment opportunities through policy and/or administered-program commitments.

- Transit-cost subsidies
- Vanpool provisions or cost subsidies
- Shared-vehicle access and/or subsidies
- Carpool/vanpool matching and support services
- Free shuttle service
- Remote and flex-work policies and accommodations

Promotional and Marketing Measures

These measures focus on increasing awareness of and engagement with established TDM policies, programs, and benefits.

- Engaging TMA (or similar) services
- Providing a TDM coordinator position to serve employees, tenants, and/or residents information needs
- Web- and mobile-application-based information resources
- Events, activities, and competitions/challenges

Whether your city is looking to enact a single, high-impact measure, such as congestion pricing or removing zoning-code parking requirements—or to create a coordinated and comprehensive TDM program—this guide is designed to inform decisions about how these measures can be implemented to create safer, more equitable, lower-emissions transportation systems for all.

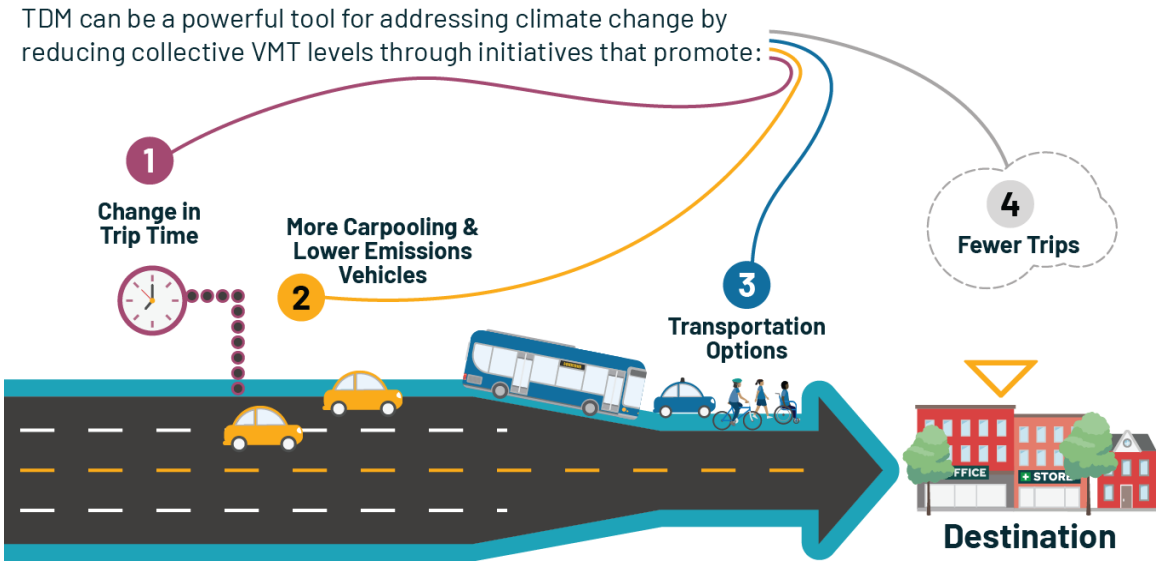
THE AIM OF THIS GUIDE

As a part of the Bloomberg Philanthropies American Cities Climate Challenge (the Climate Challenge), several U.S. cities have passed or are pursuing the implementation of citywide transportation demand management (TDM) policies and programs, as part of their broader strategies to reduce greenhouse gas emissions, improve equity, and advance other city priorities. TDM programs and policies address climate change by supporting walking, biking, and transit, thus reducing driving and the associated carbon pollution. This guide was developed as a resource for cities interested in developing their own strategic TDM programs, capturing lessons learned from policy and implementation experiences among Climate Challenge cities across the U.S. These cities' collective work since 2019 highlights effective and innovative approaches to defining TDM goals and objectives, assessing program options, and implementing context-appropriate policies and programs that can achieve tangible carbon-reduction results as well as a host of other benefits for city residents.

2 Benefits of TDM

DIRECT BENEFITS

TDM practice today encompasses a variety of strategic actions that seek to mitigate specific consequences of travel demand, typically focusing on the volume of trips taken, their timing, their spatial concentration, and/or the dominant mode/s of travel employed. The focus of TDM initiatives can be as simple as reducing how much parking demand a new development will generate, as ambitious as significantly reducing the share of citywide travel completed in single-occupancy automobiles, and as complex as modeling regional driving levels (as measured in "vehicle miles traveled" or VMT) and tracking impacts of TDM measures toward reduction goals. In any case, TDM practice has historically been optimized to directly impact travel behavior in ways that align with climate change mitigation and pollution reduction goals.



TDM can effectively reduce the intensity and duration of peak-hour congestion—sometimes with a narrow focus of simply improving traffic flows during travel peaks. At the municipal, regional, or state level, however, TDM can be a powerful tool for addressing climate change by reducing collective VMT levels through initiatives that can:

- Reduce the total number and distance of motor vehicle trips completed
- Reduce the number of personal autos used to complete those trips, often by increasing the number of trips made by foot, bicycle, public transportation, and carpooling or vanpooling
- Increase the average per-passenger fuel-efficiency of the vehicles used
- Shift trips away from locations and times in which congestion conditions directly reduce fuel efficiencies

BROADER BENEFITS

These climate and pollution benefits do not capture the full impact of TDM programs, particularly the potential benefits of expanding TDM program applicability beyond traditional commuter populations. A few examples of how TDM policies and programs can advance other critical public policy goals include:

Equity: Improving mobility choices directly expands access to jobs, education, recreation, community, and other opportunities. TDM policies and programs can be designed to ensure equitable benefits—and, ideally, benefits targeted to those who most need them. Equitable and inclusive TDM can improve people's lives, not just "manage the peak." By thinking big and changing the narrative, redefining success, expanding participation, engaging the community, and tailoring programs, wonky "TDM" can help create expanded mobility and access for all.[3] This practice of providing targeted and tailored benefits requires skills and capacity—in terms of community engagement, partner coordination, eligibility assessment, and beyond—that can be leveraged to advance a variety of public-sector equity-building programs.

Cost Parity: Existing commute subsidy programs tend to favor drivers over people who travel by other modes, which can undermine both equity and climate goals. One of the most enduring and effective TDM strategies, therefore, is to ensure that driver-related benefits—such as the free or cost-subsidized parking expected at the end of most trips—are paired with benefits of equal or greater value to those who do not or cannot make use of driver-related benefits. Offering transit-cost subsidies, giving cash reimbursements to those who do not make use of the parking benefit, or simply charging for parking and using the resulting revenue to reduce housing or commercial-lease costs are the most common TDM measures that advance this equity and climate objective, which seeks to reduce targeted subsidies to drivers and balance them with fairer subsidies for all travelers.

Street Safety: By reducing the number of automobiles on the road, reducing the stress and frustration of travel, and promoting active travel modes, effective TDM policies and programs can complement citywide road-safety initiatives seeking to eliminate travel-related fatalities and serious injuries. When paired with investments in safe street design, less driving means fewer traffic deaths for all travelers.

Smart Growth: TDM, broadly implemented, can reshape development patterns away from sprawl and toward denser growth patterns that bring more people and destinations closer to high-capacity travel networks. This improves affordable transportation access by enabling people to live and work closer to the things they care most about. It also reduces the amount of regional land consumed by parking facilities, creating more capacity for growth, reducing upfront development costs, reducing the burden of new development on regional transportation infrastructure, and thereby (in the medium-to-long-run) reducing housing costs and even the tax burdens required for infrastructure maintenance.

[3] https://nelsonnygaard.com/five-steps-toward-equitable-inclusive-tdm/, accessed 9/23/2021.

Health and Wellness: Driving alone is the least active of any commonly used travel modes. Whether applied at the site, city, or regional level, effective TDM programs will reliably result in more active travel activity and thus more active populations. More importantly, the life-extending benefits of emissions reductions will extend to whole communities, particularly those living in and around travel-intensive areas in our cities.

Inclusive Economic Growth: As multimodal mobility has become woven into the fabric of our work/life environments, TDM programs have increasingly focused on improving the quality of non-driving mobility options. Free or cheaper transit rides and more convenient non-driving travel modes make more jobs more accessible to more people within our communities. This allows local economies to grow—making it easier to attract and retain talent—and for a more diverse, equitable, and inclusive distribution of the benefits accruing from this growth.

3 Assessing Implementation Options

An effective assessment of options should include a review of proven-effective individual measures as well as the direct actions and programs that cities have leveraged to put them into effect.

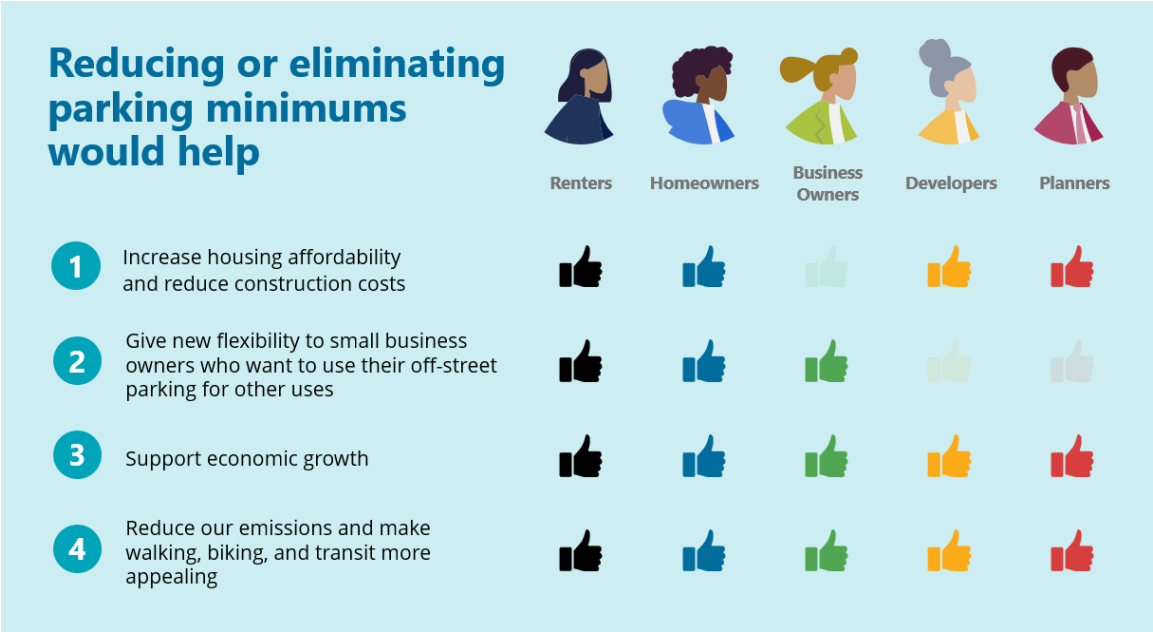
BEST PRACTICE CITY ACTIONS AND PROGRAMS

The following is an overview of the most prominent and effective options among the many available to cities for advancing TDM objectives.

Direct Actions

Cities can implement broad TDM initiatives directly, by bringing a new lens to how they regulate the use of their roadway networks and curbside spaces, or through development-code changes that target the oversupply and/or underpricing of accessory parking at new development. Whether such initiatives are implemented expressly to achieve TDM objectives, they consistently result in a significant reduction to personal-vehicle dependence. In doing so, they have demonstrated just how effective single or coordinated municipal policies can be as mechanisms for TDM implementation.

PARKING REQUIREMENTS REFORM

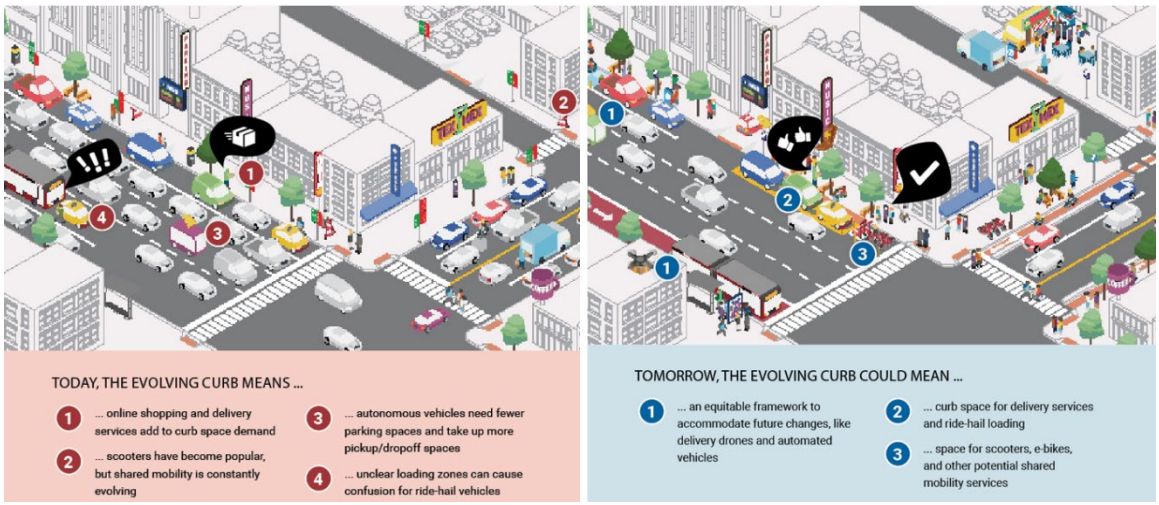


Most zoning codes require developers to include off-street parking with their projects—whether the projects were for newly built land uses or the reuse of existing buildings. The requirements typically define a minimum amount of parking to be provided on site based on the type and scale

of land uses proposed for the project's buildings. This consideration, however, obscures the potential negative consequences of minimum parking requirements, resulting in a tendency to require significantly more parking than necessary. Over time, this contributes directly to the affordable housing crisis affecting cities across the country. Three code reform initiatives can directly counter this legacy of minimum parking requirements:

- Remove parking requirements
- Limit accessory parking supplies (parking maximums)
- Require the "unbundling" of parking costs

PARKING MANAGEMENT



For decades, curb management and operational policies focused primarily on ensuring easy parking access for individuals driving private cars, balanced by the need to support truck loading and deliveries in many urban centers. Over the last decade, however, key shifts in transportation policies have significantly increased the potential for curb management to become a central TDM tool:

1. The shift from a focus on optimizing ease and efficiency of private car movement to a focus on optimizing ease and efficiency of personal movement and access
2. The emergence of technology-aided mobility services that use curbside spaces for passenger or shared-device pick-up and drop-off
3. The intensification and diversification of urban freight operations (accelerated by stay-at-home orders introduced to combat the COVID-19 pandemic) amplifying related demands for curb access

Complementing curb management with coordinated management of off-street parking resources (whether municipally controlled or privately provided commercial or shared parking facilities) will amplify the TDM benefits, better managing limited curbside parking resources. Of particular importance is limiting incentives for drivers to search for curbside parking options by seeking cost parity or a slight discount for off-street parking options in high-demand locations. Another key complement to curbside management is the reform of zoning-code standards related to off-street parking that seek to reduce excessive off-street supplies and subsidized user costs.

CONGESTION PRICING

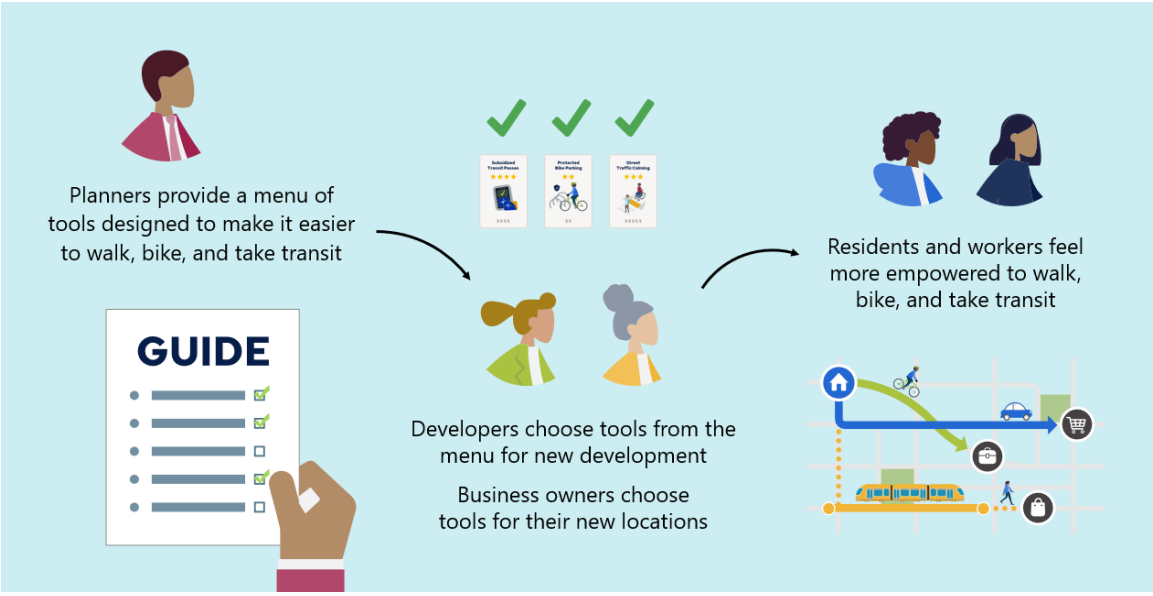
Congestion pricing programs are designed to reduce demand on congested roadways by establishing fees for driving into or within specific areas during certain times of day. These programs have been implemented throughout the world, and there are several studies underway in the United States. Congestion pricing can be implemented in several ways:

- **Cordon Pricing:** Charge single-occupancy personal autos for crossing a boundary into a pricing zone
- **Area Pricing:** Charge personal autos for both crossing a boundary and driving within a designated zone
- **Fleet/Vehicle Pricing:** Charge specific vehicle types for crossing a boundary into a zone
- **Road Usage Charge (RUC):** Charge personal autos a per-mile charge for driving within a zone, potentially by time of day and/or location
- **Corridor Pricing:** Charge personal autos that travel on a particular corridor or arterial
- **Highway Pricing:** Toll all lanes of a road or convert or add express lanes as tolled facilities, with some lanes remaining unpriced

Regulatory Actions

Cities can also establish ordinances and regulations that require developers, property owners, and/or employers to implement TDM plans/programs as part of the requirements for development approvals and/or property/employment regulations.

ZONING ORDINANCE APPROACH

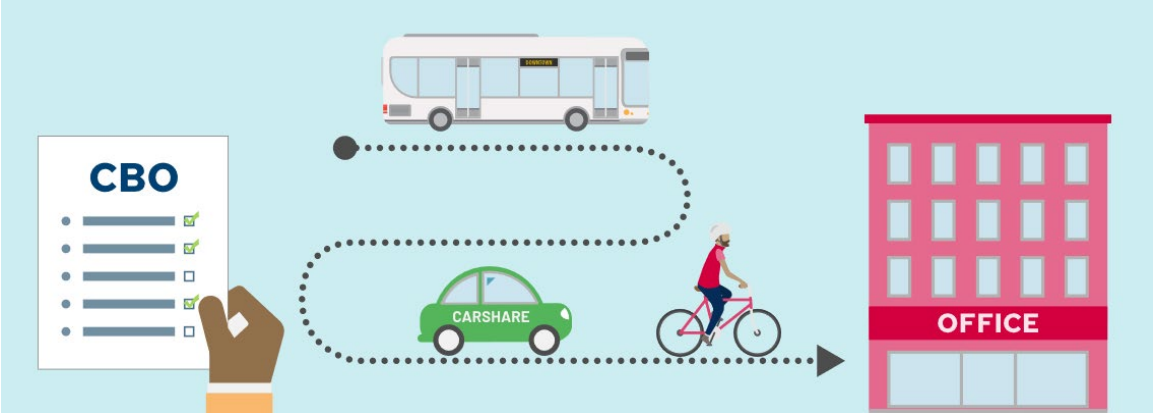


A growing number of cities have adopted changes to their development/zoning codes to establish requirements for some or all development proposals to include required TDM measures—or an approved TDM Plan—as a condition of approval.

TRAFFIC IMPACT ANALYSIS AND RELATED MITIGATION

Most cities require that proposed new development undergo some level of analysis of its potential impacts on traffic. If the number of increased trips is determined to be above acceptable levels, "mitigation" measures may be required, typically adding features such as turn lanes, traffic signals, or on-site queueing space. In more progressive jurisdictions and areas with more multimodal choices, an expanded TIA approach includes travel by all modes and recognizes that TDM approaches can help "mitigate" or reduce the impacts of private vehicle travel.

COMMUTER BENEFITS ORDINANCE



A municipal, county, or state ordinance can be used to apply a set of TDM requirements to existing properties and/or employers. These laws can be applied broadly or within specific areas, typically where there is rapid growth and/or traffic-congestion concerns.

4 City Guide to Direct TDM Actions

This section provides an overview of direct actions that cities can take to implement singularly effective TDM measures that do not require the establishment or administration of formal TDM programs.

PARKING REQUIREMENTS REFORM

For several decades, cities have used their zoning codes to require developers to include off-street parking with their projects—whether the projects were for newly built land uses or the reuse of existing buildings. The requirements typically define a minimum amount of parking to be provided on site based on the type and scale of land uses proposed for the project's buildings. These requirements were designed primarily to prevent the parking activity generated by these buildings from creating burdensome traffic and parking impacts on local streets.

This concern, however, obscures the potential negative consequences of minimum parking requirements, resulting in a tendency to require significantly more parking than necessary, either to make projects a success or to prevent parking demand from spilling over onto adjacent streets. As overgenerous parking supplies can be expected at each end of a car trip, drivers also feel entitled to pay nothing for this parking. In fact, to charge for parking in environments shaped by minimum parking requirements would be to directly invite spillover parking behaviors, as surrounding options for free parking naturally attract drivers.

Ironically, being forced to provide overgenerous parking increases the cost of development while reducing the feasibility of recouping this cost by charging for this mandated project amenity. As a result, developers must pass this cost onto renters, home purchasers, and commercial tenants—a particularly inequitable outcome for households and tenants with below-average parking needs, as they are forced to subsidize this benefit for households that generate more parking activity. Over time, this has contributed directly to the affordable housing crisis affecting cities across the country.

In a less direct way, these requirements have had an even more profound impact on housing costs and access to jobs, as our cities and urban regions have been reshaped by minimum parking requirements. As code requirements have placed vast areas of surface parking adjacent to most destinations, it has become increasingly difficult to navigate our cities via any travel mode other than a personal vehicle. Fewer and fewer destinations can be found within walking distance of homes, while the design and programming of roads have become so focused on expediting car travel between parking spaces that cycling has become a niche, largely recreational form of travel in most cities. Meanwhile, vast expansion of the collective space between buildings in our communities robs a little more time from transit riders every year.

These negative impacts have accrued subtly over time, but their cumulative impact on undermining urban public health, safety, and quality of life is hard to overstate. Three code reform initiatives can directly counter this legacy of minimum parking requirements.

Remove Requirements

Removing minimum parking requirements is the most direct approach to addressing the problems they have created. This can be focused on areas where such requirements are most problematic—areas where development density, land use diversity, and/or multimodal functionality reduce reliance on private autos for basic mobility needs, or it can be citywide. Key benefits that can accrue from this direct approach to reform include:

- Providing developers with greater flexibility in designing and programming their projects
- Increasing the potential density of new developments
- Increasing development investment by removing the direct cost of providing required parking as well as increasing the buildout potential of the project
- Facilitating development that optimizes tax-generating land-use densities

Developers generally find parking minimums inflexible and costly—limiting their choice for developing projects by forcing them to devote a significant portion of their capital costs to satisfying parking requirements. Eliminating or reducing parking minimums gives developers the flexibility to right-size parking for a specific project based on market demand. It promotes cost savings and allows developers to redirect parking funds to provide other amenities that are more aligned with mobility visions.

Example: Eliminating Minimum Parking Requirements in St Paul

In 2021, the Saint Paul, MN, City Council approved an update to its zoning ordinance that eliminated minimum parking minimum requirements citywide. "Removing barriers to our city's growth is critical to building a truly sustainable and thriving future," said City Council President Amy Brendmoen. "By leaning in and embracing this new change, Saint Paul will be able to grow and densify more quickly, allowing us to fulfill the growth and prosperity goals of our 2040 Comprehensive Plan, reducing the costs of development for everyone and welcoming more businesses, visitors, and families in our city."[4]

[4] https://www.stpaul.gov/news/city-saint-paul-remove-citywide-parking-minimums-real-estate-developments

Limit Accessory Parking Supplies (Parking Maximums)

Parking maximums set a cap on the number of parking spaces that developers can provide as part of a proposed project. This practice reverses the practice of minimum requirements, by defining limits on off-street parking based on the land uses proposed for a development project. Parking maximums can be implemented in addition to, or instead of, minimum parking requirements. Parking minimums can also simply be converted directly into maximums.

Maximums ensure that parking is not oversupplied and incentivize developers to plan and design for use of alternative transportation modes. Parking maximums can also increase development densities, improving area walkability and multimodal functionality in support of core TDM objectives. One option is to establish fixed maximums, which limit on-site parking supplies with minimal or no exceptions. Another option is to provide a "soft" or "flexible" maximum that is paired with one or more options that allow more parking. The most common options include the following:

- The provision of publicly shared parking, with these spaces simply not counted toward the project's maximum
- The payment of a fee for each space provided in excess of the maximum
- The provision of mobility improvements and/or implementation of TDM measures

Whether using a fixed or flexible approach, establishing maximum parking limits can achieve several key benefits, not limited to the following:

- Facilitating and encouraging higher development densities
- Incentivizing investments in alternative transportation modes
- Preventing oversupply of parking
- Reducing traffic congestion and VMT by reducing parking activity
- Reducing housing costs by reducing the cost of constructing parking and increasing the potential number of units that can be developed
- Emphasizing the expectation of reduced parking needs

Example: Flexible Parking Minimums in San Jose

In 2021, the City of San Jose, CA, established a version of the flexible maximum approach at a district level. Based on its established SOV mode share target of 35%, City planners calculated how much parking could be built within its growth districts and still achieve this goal. The calculated supply of 12,000 spaces was applied to the number of dwelling units and scale of non-residential development expected in these districts, resulting in target ratios of 1 space per dwelling unit and 1.5 spaces per 1,000 square feet of non-residential development. Within these districts, new developments that include parking in excess of these ratios are encouraged to make the excess portion of that supply publicly available. This publicly available supply will then be leveraged to encourage future developments to provide parking below the target ratios, so the districts can avoid exceeding the 12,000-space maximum supply target.

Require the Unbundling of Parking Costs

A less direct, but profoundly effective, approach to addressing the problems created by minimum parking requirements is to require developers and all subsequent property owners to offer parking only as an optional, fee-based amenity. In most parts of the country, the cost of constructing and maintaining the parking provided at new developments is rarely directly paid for by its end users. Rather, its contribution to a project's overall development cost typically gets "bundled" into the cost of renting, leasing, or purchasing the project's dwelling units and commercial spaces. This cost remains hidden when the parking is offered as a "free" amenity to building residents and tenants. All residents pay for parking, regardless of whether they need or use it. Commercial-space occupants all pay for parking, affecting their operating costs and the wages they can pay, and/or the prices they must charge, to stay in business.

This also puts transit at a competitive disadvantage in vying for share of local travel if most travelers are provided free (bundled) parking at each end of most of their trips. Making parking an optional, fee-based amenity, often referred to as unbundling parking, is a simple means of avoiding this, by ensuring that the cost of parking is paid for by those that use it and based on how much of it they use. Parking can be unbundled from housing by offering residents the option to lease or purchase units and parking spaces separately. Parking that is similarly unbundled from commercial leases allows businesses to purchase only the number of parking spaces they deem necessary for employees and customers.

Example: Unbundled Parking in Seattle

In 2018, the City Council for Seattle, WA, approved legislation with several changes to parking rules in the land use code. As a result of one of those changes, the code now requires the unbundling of parking space costs from multifamily dwelling unit rental agreements. This is required for all multifamily dwelling units citywide, except for rent/income-restricted housing, accessory dwelling units, and any dwellings where garages are integrated into the unit (like townhouses). It also requires the unbundling of parking costs from commercial lease agreements for spaces 4,000 square feet or greater in size.

CURBSIDE MANAGEMENT

Curb management today relies on physical delineations of curb space through static signage and paint. Much of the data gathered at the curb is also one-off, analog data (such as observations of parking use). Implementing advanced digital tools to collect usage data in real time can also allow cities to create a digital interface for curb space that can be modified to respond to unique demand. For decades curb management and operational policies focused primarily on ensuring easy parking access for individuals driving private cars, balanced by the need to support truck loading and deliveries in many urban centers. Parking was most often provided for free—or at rates considerably below market value—in line with and further perpetuating a culture of subsidizing driving-based mobility at great cost to broader mobility, equity, road safety, economic, climate, air quality, and sustainability goals.

Over the last decade, however, increased understanding of transportation's impact on the economy, built environments, health, and quality of life has inspired notable shifts in transportation polices. Three such shifts have had noteworthy repercussions on the management of the curb:

1. The shift from a focus on optimizing ease and efficiency of private car movement, to a focus on optimizing ease and efficiency of person movement. This has led many cities to deprioritize on-street parking to increase curbside access to transit and bicycles.
2. The emergence of technology-aided mobility services—from ride-hailing services like Uber and Lyft that need access to the curb for passenger pick-up and drop-off to car share, bike share, and scooter share services that require prominent curb space for vehicle pick-up and drop-off.
3. Intensification and diversification of urban freight operations (accelerated by stay-at-home orders introduced to combat the COVID-19 pandemic), amplifying related demands for curb access.

As a result of these changes, the curb has become a more prominent place for intervention and policy setting in urban mobility and freight delivery. The curb increasingly mediates new layers of travel modes and services with established uses and legacy infrastructure assets not designed to accommodate them.

Given the sudden complexity of curb space demands, innovative best practice curb management interventions will be instrumental to achieve core policy goals, such as reducing GHG emissions, shifting mode split, bolstering transportation equity, and eliminating traffic fatalities and injuries. This includes adopting a TDM lens to prioritize management uses and functions; utilizing curb allocation to elevate the mobility options best aligned with municipal and community goals; and incentivizing or discouraging certain types of trips, mode choices, and behaviors in service of broader mobility goals.

To keep a focus on outcomes amidst change, curb management policies need ongoing performance monitoring and evaluation (M&E) systems. These assess what is working, what is not, and what changes might be necessary. An M&E system can also accommodate a more experimental and proactive approach to curb management, allowing planners to pilot new ideas to achieve desired outcomes. An effective M&E system requires high-quality input data. As the mobility ecosystem becomes more complex, the need for data sharing and data processing simultaneously expands.

In response to this challenge, cities across the country are working together to develop new mobility data sharing standards. These standards not only benefit providers by ensuring a consistent set of requirements; they also allow cities to develop open-source tools for data sharing and processing. The following are the most common approaches to this:

- **The Mobility Data Specification (MDS):** Through MDS, cities can require private operators of shared mobility devices to provide real-time information about their vehicles, including their availability and the location of where they are parked. This information enables cities to communicate in real time with service providers and customers.
- **"Coding the Curb":** This involves recreating elements of the public right-of-way, including curbs, signs, and other physical assets, in digital form. Coding the curb aims to create a comprehensive system for describing the dimensions, locations, allowed uses, and regulations of the curb that can be understood and actively managed by cities, providers, and developers.
- **Dynamic Curb Management:** Many cities have already implemented dynamically priced parking schemes in high demand areas. This could evolve to incentivize different mode choices and use cases throughout the day or in response to fluctuating traffic and shifting demands for curb access and priorities.

The benefits offered by these approaches can be further optimized through intuitive, straightforward, and easily accessible regulations and signage as well as comprehensive technology solutions, such as digital signs and sensors that communicate current operating restrictions and pricing to users and facilitate real-time, dynamic management.

Example: Los Angeles's Code the Curb Initiative

As the transportation ecosystem continues to evolve across the greater Los Angeles area with emerging modes moving more people every day, the Los Angeles Department of Transportation (LADOT) is working to build digital infrastructure to support the dynamic coordination and active management of the public realm. This includes establishing agency-wide policies, procedures, and an enterprise asset management system to enable orchestration and coordination of competing uses of the curb. This will ensure continuity with ongoing efforts outlined in LADOT's Technology Action Plan and identify pilot opportunities for testing curb management use cases and translating curb management policies via the Mobility Data Specifications (MDS). This will provide LADOT with near-term opportunities to establish a framework for advancing their overarching asset management program by incorporating valuable insights and lessons learned from the dynamic environment of the curb today.

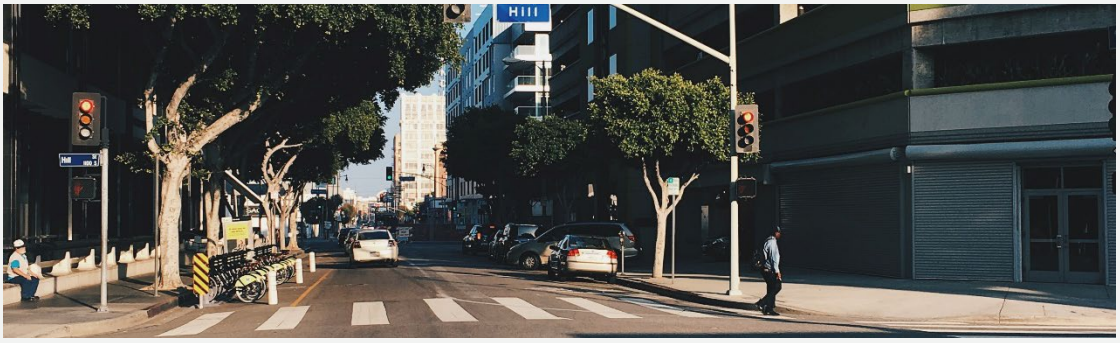


Photo by Max Kukurudziak on Unsplash.

CONGESTION PRICING

Congestion pricing programs are designed to reduce demand on congested roadways by establishing fees for driving into or within specific areas during certain times of day. These programs have been implemented throughout the world, and there are several studies underway in the United States. Congestion pricing can be implemented in several ways as represented below:

- **Cordon Pricing:** Charge single-occupancy automobiles for crossing a boundary into a pricing zone. For example, if someone lives within the pricing zone, they are only charged for trips entering or exiting the zone. They are not charged for trips within the zone.
- **Area Pricing:** Charge personal autos for both crossing a boundary and driving within a designated zone. For example, if someone lives within the pricing zone, they are charged for every trip made within the zone.
- **Fleet/Vehicle Pricing:** Charge specific vehicle types for crossing a boundary into a zone, such as ride-hailing or commercial personal autos.
- **Road Usage Charge (RUC):** Charge personal autos a per-mile charge for driving within a zone, potentially by time of day and/or location.
- **Corridor Pricing:** Charge personal autos that travel on a particular corridor or arterial.
- **Highway Pricing:** Toll all lanes of a road or convert or add express lanes as tolled facilities, with some lanes remaining unpriced.

Congestion pricing strategies have the potential to benefit all residents of a city or region, and if implemented properly, they can provide particular benefit to historically underinvested communities (such as people of color, people with limited English proficiency, and people with low incomes). The success of a congestion pricing program depends largely on how and when people are charged and how revenue from congestion pricing strategies is used. Potential benefits of successfully implementing congestion pricing include:

- **Safer Streets:** Reduces the number of cars and invests revenues for safe bicycle and pedestrian networks in historically disadvantaged communities
- **Healthier Communities:** Reduces traffic and the associated health risks to communities of concern
- **Better Mobility Options:** Helps fund a variety of mobility options, such as improved transit service or special programs to benefit people with limited mobility, such as older adults and people with disabilities
- **Behavior Change:** Influences behavior by assigning a price to when, where, and how much people drive

Example: Congestion Pricing in London (UK)

The region of Greater London, England, instituted cordon pricing in 2003 in response to congestion within the core that limited economic productivity and mobility. Within two years of implementation, the charging program resulted in a 30% drop in vehicle trips during the peak travel periods when charging was applied. This translated into a 30% reduction in delays to vehicle traffic, with proportional savings to those traveling by bus and improvements to sales by businesses within the pricing zone. Congestion charging also yielded $230 million in net annual revenue that could be reinvested in mobility improvements.[5] Over the first 15 years after implementation, a significant amount of traffic shifted out of the peak (charged) periods. During the COVID-19 pandemic, this pattern accelerated. As a result, the charging period has recently been extended.[6] Over time, the region instituted a low-emissions zone over a wider area, with the goal of further reductions in vehicle pollution. Initial success of this larger zone, including a 44% drop in NO_2, led to a 2021 expansion of the zone to include over 25% of the region's area and everyday charging.[7]

Photo by chan lee on Unsplash.

[5] "Seattle Congestion Pricing Study: Phase 1 Summary Report," City of Seattle Department of Transportation, May 2019. Accessed Nov. 2021 at https://www.seattle.gov/documents/departments/sdot/about/seattlecongestionpricingstudy_summaryreport_20190520.pdf.

[6] "Temporary Changes to the Congestion Charge to Secure Safe Recovery," TfL Transport for London, 16 June 2020. Access Nov. 2021 at https://tfl.gov.uk/info-for/media/press-releases/2020/june/temporary-changes-to-the-congestion-charge-to-secure-safe-recovery.

[7] "The Mayor's Ultra Low Emissions Zone for London,", Mayor of London, undated. Accessed Nov. 2021 at https://www.london.gov.uk/what-we-do/environment/pollution-and-air-quality/mayors-ultra-low-emission-zone-london.

5 City Guide to TDM Program Implementation

This section provides an overview of formal, coordinated, and comprehensive city/county-initiated TDM programs.

TDM IN THE DEVELOPMENT CODE

New or updated zoning ordinances that create a requirement for some development projects to include a TDM plan will need to include the following details.

Determine Applicability

Determine the character of projects for which the requirements will be applicable based on proposed land uses, development scale, location, trip-generation projections, parking supply, etc. For reasons of practicality, smaller projects, such as residential developments with less than 10 units or non-residential projects with less than 10,000 occupied squared feet, are typically exempt. Projects at these scales may lack the adequate space to accommodate required physical TDM elements and may have limited resources to implement programmatic measures and monitor efficacy of TDM measures. Requiring comprehensive TDM plans for development at these scales may also prove prohibitively expensive and discourage development, potentially placing artificial barriers to the provision of housing supply.

Example: Common Thresholds for TDM Requirements

Common thresholds for defining TDM plan requirements for new development:

SQUARE FEET OF CONSTRUCTION OR RENOVATION

Examples:

- ≥ 5,000 square feet of new construction (Buffalo, NY)
- ≥ 10,000 square feet of new construction (San Francisco, CA)
- ≥ 50,000 square feet of renovation and a change a land use (Buffalo, NY)
- ≥ 50,000 square feet of non-residential development in a mixed-use development (Pasadena, CA)

VEHICLE TRIPS DURING PEAK HOUR

Examples:

- ≥ 100 vehicle trips for a commercial development (Boulder, CO)
- ≥ 20 vehicle trips for a residential development (Boulder, CO)

DWELLING UNITS

Examples:

- ≥ 10 new or altered dwelling units in a commercial/mixed-use zone (Portland, OR)
- ≥ 100 units of a multifamily development (Pasadena, CA)

CHANGE OF LAND USE

Examples:

- ≥ 25,000 square feet of occupied floor area in a development with a change of land use (San Francisco, CA)
- ≥ 50,000 square feet of renovation and a change a land use (Buffalo, NY)

PROXIMITY TO TRANSIT AS BASIS OF TDM PLAN REQUIREMENT

Example: Any development for which more than fifty (50) percent of its parcel is within one-quarter (¼) mile of a light rail line, a bus rapid transit line, and a streetcar line must include a TDM plan as part of the site plan review application. (Saint Paul, MN, pending authorization).

Define Options for Assembling a TDM Plan

A range of TDM strategies can be approved for inclusion in required TDM plans. Recent trends have favored offering a wide range of options, providing developers with more latitude to select measures that they find most favorable to their interests (such as making their project more marketable), while limiting available options to those known to consistently advance TDM goals. The following primary models for defining approved measures for TDM plans are summarized below, in order of increased choice and flexibility for developers.

REQUIRED MEASURES

Many programs identify a small set of proven-effective TDM strategies that are established as core requirements applied to all mandated developments. The strategies most required by these programs include pricing-related strategies such as unbundling parking, transit benefits/subsidies, carpool incentives, and employee surveys and results reporting.

AVAILABLE MEASURES

A basic menu of options can guide developers in crafting a TDM plan. In this approach, the project's TDM plan is evaluated for its effectiveness—either by a professional consultant or by City staff from the development-review, traffic-engineering, planning, or other relevant department—and approval in meeting the project's TDM requirements.

POINTS-BASED MENU OF OPTIONS

A points-based menu of options allows developers to craft a TDM plan with point values attributed to TDM strategies. Points values assigned to TDM options are weighted based on their relative effectiveness in reducing demand. Development proposals will then be assigned a minimum number of points, based on measures of likely impact on travel/parking demand. The points associated with the selected set of TDM commitments must equal or surpass this number

for approval. This combines choice, while limiting choice to options that collectively promise meaningful impacts on parking and travel demand.

PROVIDE A GUIDE

Regardless of the method of documentation, a guide should be provided to offer clear descriptions for how each measure is implemented before occupancy and maintained after occupancy. For requirements that are points based, additional "bonus" points can be defined for implementation of measures at a higher level of intensity (i.e., providing shuttle service at a higher frequency than minimum prescribed headways), thus providing developers with an incentive to commit to highly effective forms and levels of TDM implementation. Providing technical guidance in an administratively created guide can also be valuable to avoid cumbersome technical detail in relevant enacting ordinances, which also allows more regular and nimble updates when appropriate.

SET TARGETS

If implementing a point-based system, an accompanying table of minimum points targets will need to be created, so applicants know what is required of their specific project. For a TDM plan to receive approval, the points associated with the selected set of TDM commitments must equal or surpass the target applicable to a specific development. Factors to consider when setting target ranges include:

- Zoning district or special overlay zones
- Amount of proposed on-site parking
- Amount of parking unbundled from residential or commercial leases
- Proximity to high-quality transit

Example: Points Requirement and Trip Generation in Austin

Points requirement that scales with trip generation projections (Austin, TX, pending authorization).

- When trip-generation is projected at between 1,000 and 2,000 trips, the TDM plan must include measures worth 20 points.
- When trip-generation is projected to be more than 2,000 trips, the TDM plan must include measures worth 30 points.

Define Ongoing Compliance Requirements

Zoning-based TDM plan ordinances typically include active monitoring and reporting components to ensure compliance with implementation commitments. Over the life of a development, a combination of self-reporting and city staff monitoring ensures that approved commitments are maintained. Key monitoring and reporting steps include the following:

PRE-OCCUPANCY

Prior to issuances of a Certificate of Occupancy, a site inspection is performed by the monitoring agency or partner to confirm all approved physical measures of the project's TDM plan have been

implemented. In addition, a representative from the development project, such as a TDM coordinator, provides documentation of all programmatic measures of the TDM plan that have or will be implemented at the site.

ONGOING

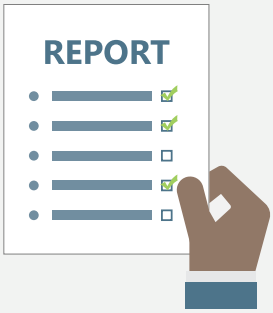
Over the life of the project, the property owner is required to provide monitoring and reporting documentation on a defined schedule but not more frequently than annually. The first monitoring report is typically triggered by a pre-determined occupancy rate. The update must verify that all measures outlined in the TDM plan have been provided. Enforcement measures can be taken, if needed, to certify compliance.

PLAN UPDATE

After the approval of a development project's building permit, the city can allow the property owner to propose updates to an approved TDM plan.

Example: Plan Reporting in Atlanta

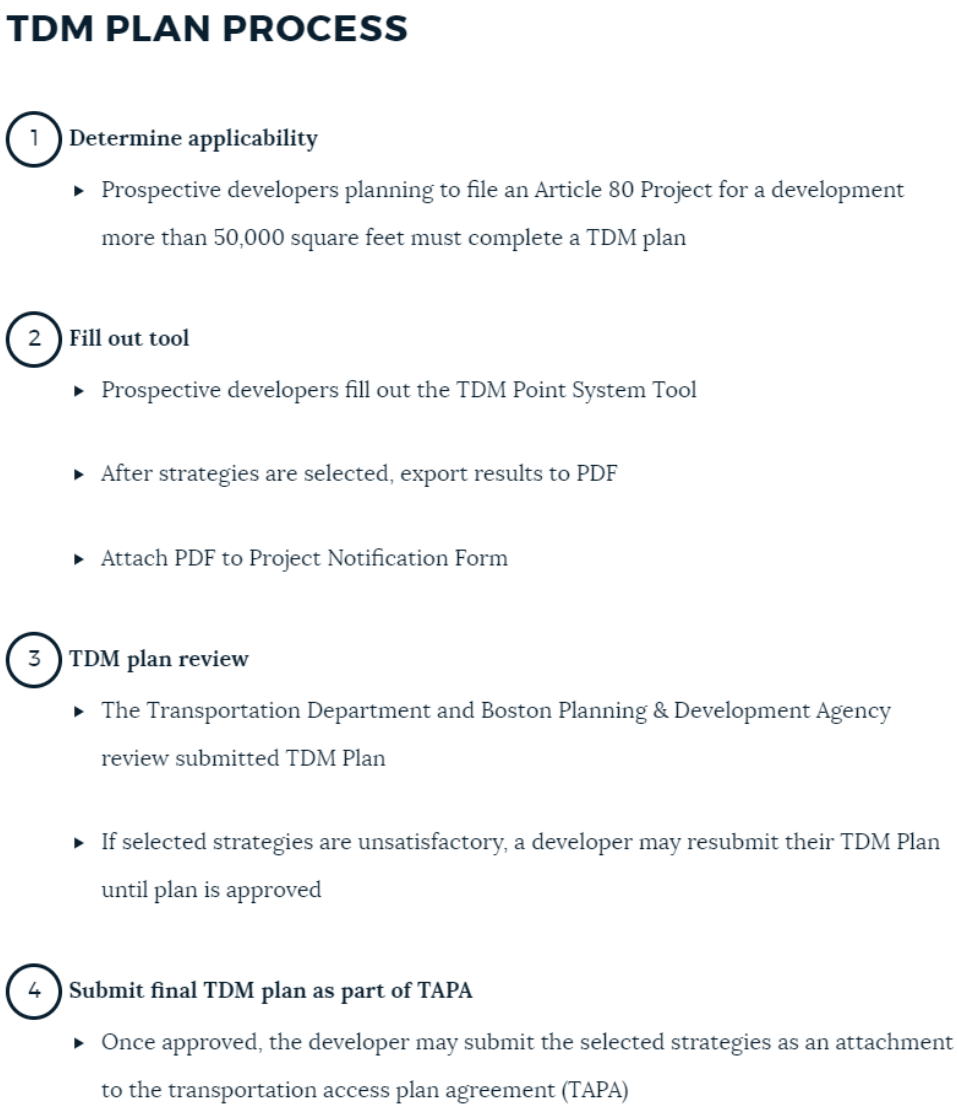
By June 1 of each year, properties must complete the City of Atlanta's Transportation Management Plan Reporting Form and submit it via the designated online portal through the City's website. As an alternative, the property owner can participate in a transportation management association (TMA), where available. On behalf of the property, the TMA will report to the City of Atlanta Office of Zoning & Development on TMP implementation and compliance.[8]



[8] City of Atlanta, Central Atlanta Progress, Livable Buckhead, and Midtown Alliance. Transportation Management Plan Development Guide. 2020.

ESTABLISHING A CLEAR PROCESS

Figure 1 Example of the TDM Plan Review Process from City of Boston



Examples: Implemented TDM Requirements

Examples of implemented TDM requirements for developers include:

- San Francisco, CA – Requires a TDM plan that consists of pre-approved measures, each of which is assigned a point value toward meeting a required minimum-point score that is set for each development based on proposed land uses and parking supplies
- Santa Monica, CA – Requires shared parking, unbundled parking, carpool/vanpool parking, bike parking, and showers/lockers

TRAFFIC IMPACT ANALYSIS AND RELATED MITIGATION

A transportation impact analysis (TIA) compares existing transportation network conditions with conditions projected from a proposed development. An applicant is expected to provide transportation improvements to mitigate negative impacts from the new development. The primary, and often exclusive, focus of a conventional TIA is on the speed of vehicle travel. In short, personal autos should always be able to travel fast, without significant delay. Common performance measures include "intersection delay," which represents how long it takes to get through an intersection, and "level of service" (LOS).

LOS assigns a letter grade of A to F depending on how much "delay" an average vehicle encounters compared to a hypothetical "free-flow" travel time. A letter grade of A indicates that essentially no other vehicles are on the road, and the representative car can exceed the speed limit. In other words, the highest grade is assigned to an illegal condition, one that wastes the vast majority of the roadway's capacity and also creates unsafe conditions for the driver and anyone or anything else their vehicle might encounter. The lowest grades represent slower-moving personal autos, whether in congested conditions or simply typical urban settings. Such grading is biased from the outset, given that it only attempts to represent conditions for drivers, and even for drivers it produces perverse outcomes. Goals like safety, access, equity, or sustainability are nowhere to be found.

In a typical TIA, an LOS analysis indicating unacceptable delay for drivers will result in a requirement that the proposed development include mitigations to reduce that delay. These mitigations are exclusively related to roadway or intersection investments that expand vehicle capacity, speed up increased or altered traffic flows, or other forms of expanded/optimized accommodation of drivers. The combination of LOS and required vehicle-focused mitigations underlies a system that continues to create driving-dependent, unsafe, and unsustainable development patterns.

TIA guidelines can, however, provide a platform for leveraging TDM solutions to mitigate the same negative impact projections. By emphasizing multimodal evaluation metrics and crediting TDM measures as mitigation options, a TIA process can expand the mitigation toolbox to include measures that better align with sustainable growth goals. TIA guidelines that forward the objectives of TDM will:

- Shift focus away from vehicle speeds and delay
- Consider all "person-trips" not just vehicle trips
- Consider impacts on all modes (MMLOS – considers level of service for auto, bus, bicycle, and pedestrian travel)
- Base desired outcomes on VMT, destination accessibility, and mode shift

TIA guidelines that support TDM should evaluate the potential impacts of a proposed development on the surrounding transportation network and services for all modes of transportation. Level and quality of service should be considered for each mode, not just personal autos. For pedestrians, this means looking at intersection safety, adjacent land uses, street design, and the perception of safety and walkability. Level of traffic stress (LTS) can be used to evaluate bicycle comfort on roads and interests based on traffic volumes, vehicle speeds, and level of separation.

TIA guidelines may be written to require TDM strategies and/or transportation improvement strategies based on the triggers described below or if a significant project impact is identified. The strategies should support any adopted Complete Streets policies and goals, with a focus on supporting a shift in transportation modes. For example, mitigation measures that would reduce vehicle demand generated by a project should be considered before measures that would increase vehicle capacity.

- Net new a.m. or p.m. peak period trips generated by projects above a context/regional specific level of significance
- Lack of existing transit amenities (where applicable)
- Location within TOD areas
- Significant generation of bicycle trips

Examples: TIA-TDM Linkages

Examples of jurisdictions with adopted links between TIA requirements and TDM as a mitigation approach include:

- Arlington County, VA – Requires some TDM measures as part of "base mitigation" and others as potential "enhanced mitigation," with ongoing monitoring paid for by the property owner
- Washington, DC – "Multimodal Transportation Analysis" (MMTA) approach to TIS explicitly focuses on access by and incentives for walking, biking, and transit
- Mountain View, CA – Establishes requirement for property owners to reduce driving trips via a suite of incentives and services, using ongoing monitoring to track effectiveness of the strategies implemented

COMMUTER BENEFITS ORDINANCE

A commuter benefits ordinance (CBO) establishes TDM requirements for existing employers. This section provides a high-level overview of the CBO concept, followed by a set of leading implementation models. The key components of a CBO are described below.

Establishing Employer Participation Parameters

To ensure small employers are not overburdened by the requirements, jobs sites can be tiered into different categories based on factors such as the number of daily employees, share of employees whose shift requires on-peak commuting, and location within specific zoning (or other formally defined) districts. Typically, employers below a certain size (25 day-shift employees, for example) are excluded all together.

Employer Obligations

The TDM measures required of participating employers can also vary by employer size and location, particularly if a tiered requirement structure is used. The most common measures include the following:

- Pre-tax benefits for transit
- Direct commuter subsides (i.e., reimbursements for transit passes or vanpool costs)
- Parking cash-out
- Daily priced parking
- Employee vanpool program
- First/last-mile shuttles to transit
- Remote work plan and flexible schedules

Participants are often required to designate an employee transportation coordinator (ETC) who serves as a primary point-of-contact to the city and/or program monitoring partners. The ETCs can also serve as a resource for employees seeking information about commuter benefit options, and they can actively promote those options internally. In some cases, it may make sense for a TMA to administer these tasks. If applicable, employers of a certain size may also be tasked with administering surveys of program performance and developing a transportation management plan to guide ongoing compliance and efficacy of programs.

Compliance Guide

Participant requirements, options, and compliance resources are typically communicated in a manner that is publicly accessible and easy to navigate and understand for applicable employers. Ideally, this guide is provided as an online resource linked to the city's website and/or that of its CBO implementation partners (such as TMAs, or similar advocacy/planning organizations).

Compliance and Enforcement

Many ordinance-based programs identify performance targets at the site level, which are tracked and used to determine compliance and/or adjust TDM requirements. While most cities do not assess penalties for not achieving targets, those targets remain, and the level of TDM commitment required may increase if they are not achieved. More often, cities levy financial penalties against employers who consistently fail to demonstrate a "good faith" effort to comply with requirements.

Most programs include some level of independent monitoring to track program compliance and performance (in terms of reduced parking and/or travel demand). Monitoring efforts are typically completed by TMA or city staff assigned to the program. Annual reports are a common component of program compliance tracking. Even programs that independently monitor compliance conditions typically require participants to compile and submit annual reports on their compliance status/efforts.

Roles and Responsibilities

Identifying the roles and responsibilities for the city and its key partners is critical to the success of a CBO program. City staff typically lead strategic planning and policy development but may establish partnerships with organizations like TMAs and MPOs to assist with reporting and advising employers on implementation of TDM measures. Within the city itself, staffing may come from multiple departments, such as transportation, economic development, or planning. Many cities can administer a CBO program with one full-time equivalent distributed among several staff members embedded into existing roles, reducing the need to establish a new position.

Costs

A city can anticipate that a CBO program will bring several costs, including strategy and policy development, program administration and reporting activities, and program coordination and support. The level of costs will vary significantly depending on the structure, aims, and administration of the program. The case studies provided in the final section of this memo include low- and high-end cost models for effective program implementation.

Funding

To fund a CBO program, a city has several funding options to consider, including CMAQ funds, parking tax, emissions fees, business license fees, and participant fees.

Examples: Implemented Trip Reduction Ordinances

Examples of where trip reduction ordinances have been implemented include:

WASHINGTON STATE

Washington state commute trip reduction (CTR) lawa and county/regional ordinances it triggers:

- Targeted at major employers, with 100 employees or more at a single worksite scheduled to begin work between 6 a.m. and 9 a.m.
- To support employers, Washington State provides formula funding to each jurisdiction.

MONTGOMERY COUNTY, MD

Montgomery County, MD, mandates the following trip-reduction actions for employers of 25 or more full- or part-time employees within one of the County's transportation management districts:

- Designate a transportation benefits coordinator to serve the company's employees
- Implement a traffic mitigation plan (TMP)—developed in consultation with TMD staff
- Submit an annual report of activities
- Pay an annual fee of $0.10/square foot (GFA), within transportation management districts
- Participate in the County's annual commuter survey

PIMA ASSOCIATION OF GOVERNMENTS, AZ

PIMA Association of Governments (AZ) travel reduction ordinance:

- Requires employers with 100 employees or more full-time equivalent employees to participate in a travel reduction program

BAY AREA, CA

Bay Area Air Quality Management District (BAAQMD) adopted an employer trip reduction program, in response to a California State law:

- Requires employers with 50 or more employees to offer their employees 1) pre-tax transit or vanpool benefits, 2) a transit or vanpool subsidy, 3) a dedicated transit/shuttle/vanpool service, or 4) an approved alternate benefit/program

6 Conclusion

Rebalancing travel incentives to support high-quality transportation choices is a critical element of any local government's climate strategy. As a complement to necessary infrastructure investments and changes to street design, TDM measures ensure that people can make transportation choices that better reflect the individual and societal benefits of various transportation options. Thankfully, the TDM field has matured considerably in the past 5-10 years, developing an increasingly robust toolbox for equitably improving transportation access, reducing transportation-related pollution, and advancing a variety of other local planning and policy goals. With a growing list of cities—including but not limited to those supported by the Bloomberg Philanthropies American Cities Climate Challenge—pushing the boundaries of TDM practice, city officials now have more examples than ever to draw from to tailor local transportation and development policies and programs to best address their most pressing challenges. This Implementation Guide is intended to help local leaders do just that—understand the state of TDM practice, work with their communities and local stakeholders to identify the TDM measures that might help advance shared goals, and then implement those measures effectively.

7 Glossary

Term	Definition
Active Transportation	Travel modes that involve some level of activity such as walking, biking, rolling in a wheelchair or personal mobility device, skateboarding, or scootering
Cash Out	Cash or other daily incentive in exchange for not using a parking space; paying people to not drive
Congestion Pricing	Road pricing that varies with the level of traffic on a congested roadway; intended to allocate roadway space efficiently
Cordon Pricing	Tolls charged for entering a particular area, such as a central business district
Mobility as a Service	The integration of various forms of transportation services (public and private) into a single mobility service accessible on demand
Mobility Hubs	A designated location that provides multiple transportation choices and amenities all in one site
Mode Split	The percentage of total trips that use a specific mode of travel (i.e., walk, bike, transit); also known as mode share
Parking Demand	The number of parking spaces people would choose to use under a specific price and quality
Parking Occupancy	Number of total parking spaces that are occupied
Parking Management	Strategies aimed at making better use of available parking supply
Parking Supply	The number of parking spaces provided
Peak Period	The time(s) of day when the roads, highways, and transit experience their highest demand for use
Shared Parking	Agreements to share parking facilities between land uses or buildings
SOV	“Single-occupancy vehicle” refers to a trip made with a single occupant in a vehicle, in contrast to a carpool or transit trip with multiple occupants in a vehicle.
TDM	“Transportation demand management” applies strategies and policies to reduce peak travel demand for single-occupancy automobiles. Trips can be shifted to different times, routes, or modes.
Telework	Telework, remote work, and work from home are all terms for allowing or encouraging employees to work in a different location than the primary work site, reducing commute trips.
Trip Cap	Typically set by local jurisdictions as a condition of development approval to limit the number of new vehicle trips generated by a development, usually during peak commute hours
VMT	“Vehicle miles traveled” is the total number of miles traveled by automobiles in a specified period of time and place—a measurement used to estimate transportation impacts and greenhouse gas emissions.

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